

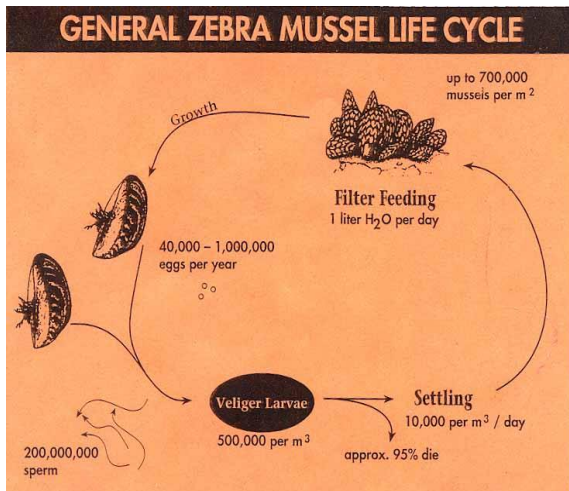
Zebra Mussels

What are Zebra Mussels? Zebra Mussels (*Dreissena Polymorpha*) are small, freshwater bi-valve mollusks (relatives to clams and oysters) that are triangular in shape with an obvious ridge between the side and bottom. The zebra mussel gets its name from the black (or dark brown) and white striped markings that appear on its shell.

Where are Zebra Mussels From? Zebra Mussels are native to the Caspian, Black and Aral Sea in Eastern Europe and Western Asia. The Zebra Mussel was first identified in the United States in the waters of Lake St. Clair in June of 1988. It is believed that the Zebra Mussels were introduced into North America through the emptying of ballast water from commercial transatlantic ships into the Great Lakes. Cargo ships carry significant amounts of ballast water to stabilize the vessels during transoceanic crossings. When ballast tanks are filled, many forms of aquatic life in the source water are drawn into the tanks. Once in ballast tanks, organisms can be transported to other areas and subsequently discharged into waters at foreign ports.

How Do Zebra Mussels Spread? Female Zebra Mussels can each produce up to one million Veligers (larvae) float in the water. If they are unable to find a hard surface, the veligers will soon die. Veligers can be spread through a variety of methods including: water currents, bait and hatchery stocking activities, anglers' bait bucket water, recreational boat engine cooling water and even scuba gear. Adult Zebra Mussels can spread by "hitchhiking" on organisms such as crayfish or by attaching to boat hulls trailered from one body of water to another, as well as the ballast of ships.

Biological & Ecological Impacts Zebra Mussels prefer water temperatures between 68 and 77 degrees Fahrenheit and have a life span of between 2-5 years. Zebra Mussels can cause a variety of problems for its environment. They can clog water pipes and infrastructure causing \$500 million in damages (US alone). In 2007, the mussels spread to Lake Mead in Nevada and on to Southern California, where one water district projects it will cost at least \$15 million a year to try to extinguish aqueduct infestations. Zebra Mussels are filter feeders that consume large portions of the microscopic plants and animals that form the base of the food web. The removal of significant amounts of phytoplankton from the water can cause a shift in native species and a disruption of the ecological balance of the lake.



Zebra Mussels can reduce native mussel populations by attaching to native mussels hindering movement, feeding and respiration. Zebra Mussels also may contain high concentrations of toxic materials that will harm or kill fish and wildlife that consume them. Decaying mussels wash ashore littering beaches and creating a noxious odor.

Ref: www.lakegeorgeassociation.org/html/zebra_mussels.htm



It's estimated that the invasive species create an enormous economic loss of \$137 billion a year of "more than double the annual economic damage caused by all natural disasters in the United States." (Aug/08 www.the-environmentalist.org) US site.

At Lake Ontario in Canada, zebra mussels cling to the inside of a rusty pipe. Zebra mussels, native to Russia, have become an invasive species in the United States and Canada. The mussels were most likely introduced to the Great Lakes in the holds of ships sailing from the ocean through the St. Lawrence Seaway. Since they were first detected in 1988, zebra mussels have disrupted local ecosystems and blocked the water intakes of factories, nuclear power plants, and municipal filtration plants. (www.learnnc.org)

How to Eliminate Zebra Mussels - To date industry has thought of the invasion of zebra mussels as impossible to eliminate or control. Currently industry is treating the zebra mussel infestation with chlorine which risks the environment and is NOT effective. **Zebra mussel elimination is 2-fold.** It is at the 'larvae' stage that the **Monoxygen™** system can be effective in killing the Zebra Mussels. Installing a **Monoxygen™ O¹** system either in the ballast of the Great Lakes ships, or at the mouth of water intake, would effectively control the reproduction of such an invasive creature. Zebra Mussels feed off the bacteria in the water, thus eliminating the bacteria with Ozone (**O¹**), eliminates the food source for them. These systems can be placed along the intake, set on timers to keep a constant flow of Ozone (**O¹**) in the water killing the larvae. Within 5-10 minutes the powerful Ozone (**O¹**) becomes Oxygen (**O²**) therefore not damaging the environment with chemicals and saving the costs of dechlorination.

The saving can be tremendous. No more costs for chlorine storage/ employee handling/ or dechlorination.

Testimony

100% of Zebra Mussel Shells - We completely eliminated the shells in our irrigation lines because of the ozonated water. The ozone killed all the bacteria in the water that the shells feed on, hence eliminating them. We never had a difficult time with them, nor did we spend money to treat them, it's just one additional benefit we noticed.

Glen Manly, Superintendent of Adobe Creek National Golf Course

Contact us at Monoxygen™ to see how the SoZone™(O¹) generator can reduce or eliminate the costs of mussel removal at your site.